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EXAMINER	
KIM, DAVID S	
ART UNIT	**PAPER NUMBER**
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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/993,696	SAKAUCHI, MASAHIRO	
	Examiner	Art Unit	
	David S. Kim	2633	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on 27 November 2001.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-34 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-34 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on 27 November 2001 is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date 28 August 2003.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☒ Other: See Continuation Sheet.

Continuation of Attachment(s) 6). Other: Additional IDS - 07 September 2004.

DETAILED ACTION

Drawings

1. Figures 1A, 1B, 2A, 2B, and 2C should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g). Corrected drawings in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.121(d)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Objections

2. **Claims 4, 10, 23, and 28-30** are objected to because of the following informalities:

In claim 4, lines 10-11, "the light signal" is used where -- the error rate information light signal -- may be intended. Otherwise, there is an antecedent ambiguity between the "error rate information light signal" of this claim and the "light signal" of parent claim 1.

In claim 10, lines 13 and 15, "code error rate" is used where -- error rate -- may be intended.

In claim 10, line 28, "that light signal" is used where -- that error rate information light signal -- may be intended. Otherwise, there is an antecedent ambiguity with the other instances of "light signal" in lines 3, 10, 13, 18, 22, and 27.

In claim 23, line 1, "claim 21" is used where -- claim 22 -- may be intended. Otherwise, antecedent basis for "the multiplexed and modulated error rate information" is lacking.

In claim 28, line 11, there is antecedent ambiguity for "the wavelength-multiplexed light" since the claim implies two instances of a wavelength-multiplexed light, one from each station. It is unclear to which instance "the wavelength-multiplexed light" is referring.

In claim 28, line 33, "the optical transmitter" is used where -- the corresponding optical transmitter -- may be intended.

In claim 29, line 4, "by the decoder to the optical transmitter" is used where – by each decoder to the corresponding optical transmitter -- may be intended.

In claim 30, line 2, there is antecedent ambiguity for "said optical fiber transmission line" since parent claim 28 includes two instances of an optical fiber transmission line. It is unclear to which instance "said optical fiber transmission line" is referring.

In claim 30, line 3-4, there is antecedent ambiguity for "the wavelength-multiplexed light" since parent claim 28 implies two instances of a wavelength-multiplexed light, one from each station. It is unclear to which instance "the wavelength-multiplexed light" is referring.

Appropriate correction is required.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. **Claims 1, 3, 6-7, 12-14, 18, and 32-33** are rejected under 35 U.S.C. 102(b) as being anticipated by Kawasaki et al. (European Patent Application EP 0 944 191 A1, hereinafter "Kawasaki").

Regarding claim 1, Kawasaki discloses:

An optical transmission system, comprising:

an optical transmitting device (Fig. 12);

an optical receiving device (Fig. 3); and

an optical fiber transmission line (e.g., transmission line 6 in Figures) placed between the optical transmitting device and the optical receiving device,

wherein said optical transmitting device comprises:

an encoder (FEC encoder 22 in Fig. 12) for encoding a data signal with an error-correcting code; and

an optical transmitter (MI-LD 212) for converting the coded data signal into a light signal based on error rate information (e.g., col. 2, l. 47-54) transmitted by the optical receiving device to provide an output, and

said optical receiving device comprises:

an optical receiver (photodiode 28 in Fig. 3) for converting the received light signal into an electrical signal; and

a decoder (FEC decoder 32 in Fig. 3) for error-correcting that electrical signal to provide error rate information and a data signal.

Regarding claim 3, Kawasaki discloses:

The optical transmission system according to claim 1, further comprising:

a line (transmission line 80 in Figures) over which the error rate information is propagated to the optical transmitting device.

Regarding claim 6, Kawasaki discloses:

The optical transmission system according to claim 1,

wherein said optical transmitter comprises:

an electroabsorption modulator (EA-MOD in Fig. 13) for modulating a laser beam through electroabsorption optical modulation based on the coded data signal;

drive control means (control unit 10, drive circuit 253, and bias voltage circuit 252 in Fig. 12) for receiving the error rate information and supplying that coded data signal and a DC bias voltage to that electroabsorption modulator.

Regarding claim 7, Kawasaki discloses:

The optical transmission system according to claim 6,

wherein said drive control means comprises:

a drive amplifier (bias voltage circuit 252 , drive circuit 253, and amplitude varying circuit 254 in Fig. 12) for amplifying (note increase of amplitude, or amplification, of modulating signal in col. 18, l. 7-10) said coded data signal and supplying (input to EA modulator 220 in Fig. 12) said amplified coded data signal and the DC bias voltage to the electroabsorption modulator; and

a controller (control unit 10) for receiving the error rate information and controlling the drive amplifier to minimize errors in the optical receiving device (col. 2, l. 47-54).

Regarding claims 12-14, claims 12, 13, and 14 are optical transmitting device claims with limitations that correspond to the optical transmitting device limitations in system claims 1, 6, and 7, respectively. Therefore, the recited means in system claims 1 and 6-7 read on the corresponding means in optical transmitting device claims 12-14.

Regarding claims 18, claim 18 is an optical receiving device claim with limitations that correspond to the optical receiving device limitations in system claim 1. Therefore, the recited means in system claim 1 read on the corresponding means in optical receiving device claim 18.

Regarding claim 32, Kawasaki discloses:

An optical transmission method, comprising the steps of:

encoding (FEC encoder 22 in Fig. 12) a data signal with an error-correcting code;

converting this signal into a light signal in an optical transmitter (MI-LD 212) with an electroabsorption modulator (EA-MOD in Fig. 13) to provide an output;

error-correcting (FEC decoder 32 in Fig. 3) the signal on receiving side to provide error rate information; and

controlling the electroabsorption modulator based on the error rate information (col. 2, l. 47-54) to reduce errors on the receiving side.

Regarding claim 33, Kawasaki discloses:

The optical transmission method according to claim 32, wherein a DC bias voltage supplied to the electroabsorption modulator is controlled to control the chirp coefficient (e.g., col. 16, l. 40-43).

5. **Claims 2, 8-9, and 19** are rejected under 35 U.S.C. 102(b) as being anticipated by Kawasaki in view of Ramaswami et al. (*Optical Networks: A Practical Perspective*, hereinafter "Ramaswami").

Regarding claim 2, Kawasaki discloses:

The optical transmission system according to claim 1,

wherein said optical transmitting device comprises a demodulator (demodulating circuit 84 in Fig. 12) for demodulating the error rate information transmitted by the optical receiving device, and

said optical receiving device comprises a modulator for modulating the error rate information provided by the decoder (Kawasaki discloses an optical transmitter (78 in Fig. 3) that converts the error rate information digital data output by the FEC decoder (32 in Fig. 3) from electronic form to an optical signal that can be transmitter over fiber (80 in Fig. 3). This very conversion is well known in the art as modulation. Ramaswami plainly teaches so (p. 177, 1st paragraph)).

Regarding claim 8, claim 8 is a system claim that corresponds to a coherent combination of the limitations in system claims 1, 2, and 3. Since all these claims are rejected under Kawasaki and Ramaswami, all the limitations of system claim 8 are found in Kawasaki and Ramaswami. Additionally, Kawasaki and Ramaswami coherently teach the limitations in claims 1-3. That is, the limitations in claims 1-3 are not divergently taught under Kawasaki and

Ramaswami. Therefore, the recited means in the coherent combination of the limitations in claims 1-3 read on the corresponding means in system claim 8.

Regarding claim 9, claim 9 is a system claim that corresponds to a coherent combination of the limitations in system claims 6 and 8. Since all these claims are rejected under Kawasaki and Ramaswami, all the limitations of system claim 9 are found in Kawasaki and Ramaswami. Additionally, Kawasaki and Ramaswami coherently teach the limitations in claims 6 and 8. That is, the limitations in claims 6 and 8 are not divergently taught under Kawasaki and Ramaswami. Therefore, the recited means in the coherent combination of the limitations in claims 6 and 8 read on the corresponding means in system claim 9.

Regarding claim 19, claim 19 is an optical receiving device claim with limitations that correspond to the optical receiving device limitations in system claim 2. Therefore, the recited means in system claim 2 read on the corresponding means in optical receiving device claims 19.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7. **Claims 4, 15-17, and 34** are rejected under 35 U.S.C. 103(a) as being unpatentable over Kawasaki as applied to claims 1, 12, and 32 above, and further in view of Morita et al. (U.S. Patent No. 5,706,112, hereinafter "Morita").

Regarding claim 4, Kawasaki discloses:

The optical transmission system according to claim 1,

wherein said optical transmitting device comprises:

an optical receiver (photodetector 82 in Fig. 12) for converting an error rate information light signal transmitted via the optical fiber transmission line into an electrical signal, and

said optical receiving device comprises:

an optical transmitter (optical transmitter 78 in Fig. 3) for converting the error rate information into the light signal.

Kawasaki does not expressly disclose:

said optical transmitting device comprises:

an optical coupler for branching an error rate information light signal transmitted via the optical fiber transmission line; and

an optical receiver for converting the *branched* light signal into an electrical signal, and

said optical receiving device comprises:

an optical coupler for introducing the light signal onto the optical fiber transmission line.

These limitations refer to a bi-directional link between the optical transmitting device and the optical receiving device. Kawasaki teaches a set of two unidirectional links. Both types of links are extremely well known in the art, each with pros and cons over each other. Morita discloses optical transmission system teachings with both types of links (Figs. 15-17). For example, note the optical coupler for branching (64), the optical receiver (63), and the optical coupler for introducing (66) in Fig. 16. At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to incorporate these components in the optical system of Kawasaki. One of ordinary skill in the art would have been motivated to do this to implement a bi-directional link. Such a link offers various well-known advantages over a set of two unidirectional links (Morita, Fig. 15), such as a reduction in the number of terminals

required to connect the optical transmitting device and the optical receiving device of Kawasaki (Morita, col. 34, l. 48-59).

Regarding claims 15-17, claims 15, 16, and 17 are optical transmitting device claims with limitations that correspond largely to the optical transmitting device limitations in system claims 12, 13, and 14, respectively. Therefore, the recited means in system claims 12-14 read on the corresponding means in optical transmitting device claims 15-17. Claims 15-17 also include limitations absent from claims 12-14. Kawasaki in view of Morita also discloses these limitations:

an optical coupler (Morita, optical coupler 64 in Fig. 16) for branching an error rate information light signal transmitted by an optical receiving device via an optical fiber transmission line;

an optical receiver (Morita, O/E conversion section 63 in Fig. 16) for converting the branched error rate information light signal into an electrical signal;

a demodulator (Kawasaki, demodulating circuit 84 in Fig. 12) for demodulating that electrical signal;

an optical transmitter (Kawasaki, MI-LD 212) for converting the coded data signal into a light signal based on the demodulated error rate information (Kawasaki, e.g., col. 2, l. 47-54) to provide an output.

Regarding claim 34, Kawasaki in view of Morita discloses:

The optical transmission method according to claim 32,

wherein the error rate transmission is sent back via the optical fiber transmission line over which the data signal is propagated (Morita, optical cable 50d).

8. **Claim 5** is rejected under 35 U.S.C. 103(a) as being unpatentable over Kawasaki in view of Morita as applied to claim 4 above, and further in view of Shigematsu et al. (U.S. Patent No. 5,214,728, hereinafter "Shigematsu").

Regarding claim 5, Kawasaki discloses:

The optical transmission system according to claim 4, wherein said optical fiber transmission line comprises:

an optical amplifier (122 and 124 in Figures) for amplifying a light signal transmitted by the optical transmitting device;

an optical coupler (not shown but conventional for connecting the input and output of optical amplifiers) placed at each of the input and output of that optical amplifier.

Kawasaki does not expressly disclose:

an optical fiber directly connecting these optical couplers.

Such optical fibers are common in the art. Shigematsu teaches such an optical fiber transmission line (e.g., Fig. 1(a)) with such an optical fiber directly connecting optical couplers (bypass optical fiber 8). At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to incorporate this optical fiber in the optical fiber transmission line of Kawasaki. One of ordinary skill in the art would have been motivated to do this to for one of a couple of reasons: to promote bi-directional transmissions (Shigematsu, col. 2, l. 64 – col. 3, l. 3) across the transmission line of Kawasaki and/or to monitor the conditions of the transmission line of Kawasaki through optical time domain reflectometry (Shigematsu, col. 2, l. 3-12, col. 3, l. 50-58).

9. **Claims 10-11 and 20** are rejected under 35 U.S.C. 103(a) as being unpatentable over Kawasaki in view of Ramaswami as applied to claims 2, 4, and 19 above, and further in view of Morita.

Regarding claim 10, claim 10 is a system claim that corresponds largely to the system claim 2. Therefore, the recited means in system claim 2 read on the corresponding means in system claim 10. Claim 10 also includes limitations absent from claim 2. These limitations

correspond to limitations introduced by claim 4. Morita is applied to address these limitations in claim 4. Similarly, Morita is applied here to address these limitations in claim 10.

Regarding claim 11, claim 11 is a system claim that corresponds to a coherent combination of the limitations in system claims 6 and 10. Since all these claims are rejected under Kawasaki, Ramaswami, and Morita, all the limitations of system claim 11 are found in Kawasaki, Ramaswami, and Morita. Additionally, Kawasaki, Ramaswami, and Morita coherently teach the limitations in claims 6 and 10. That is, the limitations in claims 6 and 10 are not divergently taught under Kawasaki, Ramaswami, and Morita. Therefore, the recited means in the coherent combination of the limitations in claims 6 and 10 read on the corresponding means in system claim 11.

Regarding claim 20, claim 20 introduces limitations that correspond to limitations introduced by claim 4. Morita is applied to address these limitations in claim 4. Similarly, Morita is applied here to address these limitations in claim 20.

10. **Claims 21 and 27-31** are rejected under 35 U.S.C. 103(a) as being unpatentable over Kawasaki as applied to claim 1 above, and further in view of Utsumi (U.S. Patent No. 6,031,644).

Regarding claim 21, Kawasaki does not expressly disclose (but Utsumi does):

An optical transmission system, comprising:

a *plurality* (optical senders 30 in Fig. 10) of optical transmitting devices for transmitting light signals of *different wavelengths*;

a *multiplexer for wavelength-multiplexing* (MUX 74) the plurality of light signals;

an optical fiber transmission line (line 26) over which *the wavelength-multiplexed light signal* is propagated;

a *demultiplexer for demultiplexing the wavelength-multiplexed light* (DMUX 76); and

a *plurality* (optical receivers 34) of optical receiving devices for receiving light signals of *the corresponding wavelengths*.

Claim 21 is similar to claim 1 in that claim 21 employs the same basic limitations of claim 1 and extends them to an optical transmission system that incorporates WDM technology. That is, claim 1 is directed to a single channel optical transmission system. Claim 21 is directed to a multiple channel WDM optical transmission system. Kawasaki does not expressly discuss the extension of its system teachings to a multiple channel WDM optical transmission system. However, such an extension is extremely well known in the art. Utsumi discloses such an extension (transition from single channel embodiment in Fig. 4 to multiple channel WDM embodiment in Fig. 10). At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to extend the single channel teachings of Kawasaki to a multiple channel WDM system. One of ordinary skill in the art would have been motivated to do this for various conventional benefits of WDM systems, such as increased overall transmission rates and increased utilization of fiber capacity. Additionally, the incorporation of the WDM teachings of Utsumi also provides the added benefit of bi-directional communications.

Regarding claim 27, Kawasaki in view of Utsumi discloses:

The optical transmission system according to claim 21,

wherein said optical transmitter comprises:

an electroabsorption modulator (Kawasaki, EA-MOD in Fig. 13) for modulating a laser beam through electroabsorption optical modulation based on the encoded data signal; and

drive control means (Kawasaki, control unit 10, drive circuit 253, and bias voltage circuit 252 in Fig. 12) for receiving the error rate information and supplying the coded data signal and a DC bias voltage to that electroabsorption modulator.

Regarding claim 28, Kawasaki in view of Utsumi discloses:

An optical transmission system, comprising:

two stations (Kawasaki, terminal devices 2 and 4 in Fig. 1; Utsumi, terminals 18' and 20' in Fig. 10), and

a down optical fiber transmission line (Kawasaki, line 6; Utsumi, line 26) and an up optical fiber transmission line (Kawasaki, line 80 in Figures; Utsumi, line 28) placed between the two stations,

wherein each of said stations comprises:

an optical transmitting section comprising a plurality of optical transmitting devices (Utsumi, optical senders 30, 36) for transmitting light signals of different wavelengths and a multiplexer (Utsumi, MUX 74, 78) for wavelength-multiplexing the plurality of light signals; and

an optical receiving section comprising a demultiplexer (Utsumi, DMUX 76, 80) for demultiplexing the wavelength-multiplexed light and a plurality of optical receiving devices (optical receivers 34, 40) for receiving light signals of the corresponding wavelengths,

said optical transmitting device comprises:

an encoder (Kawasaki, FEC encoder 22 in Fig. 12; Utsumi, FEC encoder 42 in Fig. 4) for encoding a data signal with an error-correcting code; and

an optical transmitter (Kawasaki, MI-LD 212; Utsumi, E/O 2 in Fig. 4) for converting the coded data signal into a light signal based on error rate information (Kawasaki, e.g., col. 2, l. 47-54) transmitted by the corresponding (Utsumi, col. 9, l. 27-29) optical receiving device to provide an output,

said optical receiving device comprises:

an optical receiver (Kawasaki, photodiode 28 in Fig. 3; Utsumi, O/E in Fig. 4) for converting the received light signal into an electrical signal; and

a decoder (Kawasaki, FEC decoder 32 in Fig. 3; Utsumi, FEC decoder 50 in Fig. 4) for error-correcting that electrical signal to provide error rate information and a data signal,

in the first station, each decoder of the optical receiving section transmits error rate information (Utsumi, col. 9, l. 27-29) to the corresponding encoder (Utsumi, transmissions go

through the encoder 42 in Fig. 4) of the optical transmitting section and that error rate information is transmitted to the second station, and

in the second station, each decoder of the optical receiving section transmits the error rate information (Utsumi, col. 9, l. 27-29) to the optical transmitter (Kawasaki, error rate information goes to MI-LD 212 in Fig. 12) of the optical transmitting section.

Regarding claim 29, Kawasaki in view of Utsumi discloses:

The optical transmission system according to claim 28,

wherein said second station comprises a multichannel demodulator (Kawasaki in view of Utsumi, single channel demodulating circuit 84 in Fig. 12 extended to a multichannel version in view of the multichannel nature of Kawasaki in view of Utsumi).

Kawasaki in view of Utsumi does not expressly disclose:

said multichannel demodulator *for error-correcting* the error rate information transmitted by the decoder to the optical transmitter.

However, error-correcting is a common technique that Kawasaki in view of Utsumi already discusses in other teachings (e.g., Kawasaki, col. 6, l. 2-11, col. 11, l. 14-21; Utsumi, col. 5, l. 8-13). At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to arrange said multichannel demodulator to error-correct the error rate information transmitted by each decoder to the corresponding optical transmitter. One of ordinary skill in the art would have been motivated to do this to ensure that the optical transmitters receive the error rate information with high accuracy. That is, the error rate information is a crucial portion of Kawasaki's invention. The entire inventive thrust of Kawasaki is to control the chirp parameter (abstract), and this control cannot be properly performed without accurate error rate information.

Regarding claim 30, Kawasaki in view of Utsumi discloses:

The optical transmission system according to claim 28,

wherein said optical fiber transmission line comprises an optical amplifier (Kawasaki, optical amplifiers 122 and 124 in Figures; Utsumi, optical amplifiers 32 and 38 in Figures) for amplifying the wavelength-multiplexed light.

Regarding claim 31, Kawasaki in view of Utsumi discloses:

The optical transmission system according to claim 28,

wherein said optical transmitter comprises:

an electroabsorption modulator (Kawasaki, EA-MOD in Fig. 13) for modulating a laser beam through electroabsorption optical modulation based on the coded data signal; and

drive control means (Kawasaki, control unit 10, drive circuit 253, and bias voltage circuit 252 in Fig. 12) for receiving the error rate information and supplying the coded data signal and a DC bias voltage to that electroabsorption modulator.

11. **Claims 22-24** are rejected under 35 U.S.C. 103(a) as being unpatentable over Kawasaki in view of Ramaswami as applied to claims 2 and 21 above, and further in view of Utsumi.

Regarding claim 22, Kawasaki in view of Ramaswami does not expressly disclose:

The optical transmission system according to claim 21, further comprising:

a multichannel modulator for multiplexing and modulating error rate information provided by each decoder; and

a multichannel demodulator for demodulating and demultiplexing the error rate information transmitted by that multichannel modulator to provide it to the corresponding optical transmitter.

Rather, Kawasaki in view of Ramaswami addresses a single channel version of these claim limitations (see treatment of claim 2 above). Claim 22 is similar to claim 2 in that claim 22 employs the same basic limitations of claim 2 and extends them to an optical transmission system that incorporates WDM technology. That is, claim 2 is directed to a single channel

optical transmission system. Claim 22 is directed to a multiple channel WDM optical transmission system. Kawasaki in view of Ramaswami does not expressly discuss the extension of its system teachings to a multiple channel WDM optical transmission system. Utsumi is applied to present such an extension in the treatment of claim 21 above. Similarly, Utsumi is applied here to present such the extension in the treatment of claim 22 here. Accordingly, Utsumi would encourage a multichannel version of the teachings of Kawasaki in view of Ramaswami. In particular, Utsumi would encourage:

a multichannel (Utsumi, note the multiple channel WDM system in Fig. 10) modulator for multiplexing (Utsumi, MUX 78) and modulating (Kawasaki in view of Ramaswami, treatment of claim 2 above) error rate information provided by each decoder (Utsumi, col. 9, l. 27-29); and

a multichannel (Utsumi, note the multiple channel WDM system in Fig. 10) demodulator for demodulating (Kawasaki, demodulating circuit 84 in Fig. 12) and demultiplexing (Utsumi, DMUX 80) the error rate information transmitted by that multichannel modulator to provide it to the corresponding optical transmitter (Utsumi, control in Fig. 4 to each respective optical sender 30A in Fig. 10).

Regarding claim 23, Kawasaki in view of Ramaswami and Utsumi discloses:

The optical transmission system according to claim 22, further comprising:

an optical receiver (Kawasaki, photodetector 82 in Fig. 12; Utsumi, optical receivers 40 in Fig. 10) for converting the error rate information light signal into an electrical signal.

Kawasaki in view of Ramaswami and Utsumi does not expressly disclose:

an optical transmitter for converting the multiplexed and modulated error rate information into a light signal to introduce it onto the optical fiber transmission line.

This portion of claim 23 implies two claim limitations. The first is that said multiplexed and modulated error rate information is in an electrical format before conversion by the optical transmitter into an optical light signal. The second is that the error rate information light signal propagates back to the optical transmitting devices on a bi-directional link.

Regarding the first limitation, Utsumi suggests multiplexing in the *optical* domain rather than the *electrical* domain (MUX 78 in Fig. 10). However, multiplexing and modulating in either domain is extremely well known in the art, electrical multiplexing and modulating being even further developed than optical multiplexing. At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to multiplex and modulate the error rate information in the *electrical* domain for conversion in a light signal by an optical transmitter. One of ordinary skill in the art would have been motivated to do this since processing (i.e., multiplexing and modulating) signals in the electrical domain is conventionally cheaper, more stable, and technologically simpler than processing signals in the optical domain.

Regarding the second limitation, the prior art of record shows a set of two unidirectional links. However, unidirectional and bi-directional links are both extremely well known throughout the communication arts, each with pros and cons over each other. Ramaswami further teaches optical implementations of both types of links (p. 505, Fig. 13.1). At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to convert the unidirectional WDM system of Kawasaki in view of Ramaswami and Utsumi into a bi-directional WDM system (Ramaswami, p. 505, structure of Fig. 13.1(b)). One of ordinary skill in the art would have been motivated to do this since bi-directional links offer various well-known advantages over a set of two unidirectional links, such as gradual building of capacity, asymmetric traffic (Ramaswami, p. 505-507), and usage of less fiber. Accordingly, the error rate information would propagate on said optical fiber transmission line.

Regarding claim 24, Kawasaki in view of Ramaswami and Utsumi discloses:

The optical transmission system according to claim 23,

wherein the error rate information light signal provided by the optical transmitter is introduced through the demultiplexer (Ramaswami, p. 505, right side mux/demux in Fig. 13.1(b)) onto the optical fiber transmission line and that error rate information light signal is provided to the optical receiver through the multiplexer (Ramaswami, p. 505, left side mux/demux in Fig. 13.1(b)).

12. **Claims 25-26** are rejected under 35 U.S.C. 103(a) as being unpatentable over Kawasaki in view of Utsumi as applied to claim 21 above, and further in view of Shigematsu.

Regarding claim 25, claim 25 introduces limitations that correspond to limitations introduced by claim 5. Shigematsu is applied to address these limitations in claim 5. Similarly, Shigematsu is applied here to address these limitations in claim 25.

Regarding claim 26, Kawasaki in view of Utsumi does not expressly disclose:

The optical transmission system according to claim 25,

wherein a dispersion compensator is connected to the optical amplifier.

However, it is known there is a myriad of types of dispersion compensators throughout the art. One can find a dispersion compensator for virtually any point along an optical fiber transmission link, including those connected to optical amplifiers. At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to employ a dispersion compensator that is connected to the optical amplifier. One of ordinary skill in the art would have been motivated to do this to combat signal degradation from dispersion and also to combine this function at the location of the optical amplifier. That is, connecting a dispersion compensator at a different location along the optical fiber transmission link would require additional installation points for such components. Connecting it to the optical amplifier would consolidate the installation requirements and costs to that of one location.

Conclusion

13. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Yoneyama and Miyachi et al. are cited to show multiple channel WDM optical transmission systems with related control measures.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to David S. Kim whose telephone number is 571-272-3033. The examiner can normally be reached on Mon.-Fri. 9 AM to 5 PM (EST).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jason Chan can be reached on 571-272-3022. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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DSK

Hanh Phan
Primary Examiner
11/26/04